

S/080/61/034/012/007/017
D258/D305

AUTHOR: Semikozov, G.S.

TITLE: The electrochemical purification of a nickel electrolyte from lead to zinc impurities

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 12, 1961, 2680 - 2685

TEXT: The author attempted to remove the bulk of Pb and Zn impurities occurring in cathodic Ni. Specifically, the concentration of Pb was to be lowered from 0.6 mg/lit. to 0.10-0.15 mg/lit. in the electrolyte. He used a solution containing $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ (290 g/lit.), NaCl (100 g/lit.), Na_2SO_4 (30 g/lit.) and added impurities. This solution flowed at a controlled rate through the "preliminary electrolysis" bath. The bath had dimensions of 313 x 79 x 76 mm and contained 5 cells, having a total cathode area of 0.0262 m². Air was admitted at a rate of 58.10⁻³ lit./sec. The first series of experiments served to establish general working conditions: pH ≤ 2.2; T = 50°C; a current intensity of 0.4 A. The second series investiga-

Card 1/4

The electrochemical purification ...

S/080/61/034/012/007/017
D258/D305

ted the extent of purification as a function of the rate of flow Q. The initial concentration of the impurities in Ni was 0.0029 % of Zn and 0.0032 % of Pb. The current density used was 15.2 A/cm². The following factors of impoverishment (ratio of concentration in initial to purified solutions) are taken from Table 2:

Table 2.

Rate of flow (ml/hr)	Factor of impoverishment		
	Zn	Pb	Ni
137	2.90	14.5	1.025
299	1.62	8.65	1.010
413	1.82	8.65	1.020
563	1.38	5.72	1.045
785	1.45	4.57	1.023

Card 2/4

The electrochemical purification ...

S/080/61/034/012/007/017
D258/D305

The unsatisfactory removal of Zn was attributed to the low current density used, eventually preventing the discharge of Zn ions at the limiting current. The last series investigated the purification at varying current densities, using a rate of flow of 340 ml/hr. The factor of impoverishment of Zn rose steadily, from 1.33 at 15.2 A/cm² to >20 (at 100.0 A/cm²). The resulting loss of Ni expressed in the same terms, was 1.030 and 1.142, while Pb was satisfactorily removed at any current density used. The results for Pb (Table 2) were used to verify formula

$$\frac{C_{i(in.)}}{C_{i(pur.)}} = \left(1 + \frac{K_{gi} S}{Q}\right)^n \quad (1)$$

by plotting $5\sqrt{C_{i(in.)}/C_{i(pur.)}}$ against Q and $1/Q$. The resulting straight lines yielded a value of $K_{gi} = 0.7 \cdot 10^{-3}$ cm/sec. Thus it is shown that Pb can be removed at low current densities, while the

Card 3/4

The electrochemical purification ...

S/080/61/034/012/007/017
D258/D305

removal of Zn necessitates high current densities and is, therefore accompanied by a significant loss of Ni. There are 3 tables, 2 figures and 5 Soviet-bloc references.

ASSOCIATION: Kafedra elektrokhemii Leningradskogo tekhnologicheskogo instituta imeni Lensovet (Department of Electrochemistry of the Leningrad Technological Institute imeni Lensovet)

SUBMITTED: September 15, 1960

Card 4/4

SEMIKOZOV, G.S.; KRUGLOVA, Ye.G.; KALINKIN, I.P.

Determination of microquantities of copper with lead diethyldithiocarbamate in zinc solutions and electrolytes for galvanization. Izv. vys.ucheb.zav.; khim. i khim.tekh. 7 no.2:194-197 '64. (MIRA 18:4)

1. Kafedra analiticheskoy khimii Leningradskogo tekhnologicheskogo instituta im. Lensovetu.

SEMIKRASOV, G.G., dorozhnyy master

Improve the quality of switches. Put' i put.khoz. no.7:33 '62.
(MIRA 15:7)

1. Chuyskaya distantiya Kazakhskoy dorogi.
(Railroads--Switches)

SEMLET, Z. V.

"Investigation of the Coefficient of Heat Emission of a
Sprinkling Heat Exchanger From the Sprinkler Side." Cand Tech Sci,
Inst of Heat Power Engineering, Acad Sci Ukrainian SSR, Kiev, 1955.
(KL, No 10, Mar 55)

SO: Sum. No. 670, 29 Sep 55-Survey of Scientific and Technical
Dissertations Defended at USSR Higher Educational Institutions (15)

PHASE I BOOK EXPLOITATION SCV/3893
SCV/31-X-14

Academy of Sciences USSR, Institut teploenergetiki

Teploenergetika (Heat Transfer and Hydrodynamics) Kiyev, 1978. 120 p. (Series: Its: Sbornik trudov, no. 1.) 2,000 copies printed.

Eds.: Ya.L. Kaplan and N.M. Latynova; Tech. Ass.: M.I. Yefimov; Editorial Board: I.T. Shvets (Resp. Ed.), A.S. Krasovskiy, G.M. Shtegolev (Deputy Resp. Ed.), Candidate of Technical Sciences; N.P. Rodionov (Deputy Secretary), Candidate of Technical Sciences; I.V. Gornobabiy, Corresponding Member, Academy of Sciences, USSR; I.V. Gornobabiy, Candidate of Technical Sciences; N.A. Varchuk, Candidate of Technical Sciences; P.I. Larinov, Professor; and N.M. Pyatyabin, Candidate of Technical Sciences.

PURPOSE: This collection of articles is intended for scientific workers and technical personnel in the fields of heat transfer and hydrodynamics.

CONTENTS: This collection of 18 articles deals with experimental and theoretical studies of problems in heat transfer and hydrodynamics as they affect steam and gas turbines and heat-exchange devices. The results of theoretical investigations of heat transfer in turbine components and in elements of heat-exchanging apparatus are described, and raw calculation and aerodynamics of steam turbines are discussed. Several problems of the thermodynamics and aerodynamics of steam and gas turbines are discussed. References follow each article.

TABLE OF CONTENTS:

Shvets, I.T., O.A. Gerasimchenko, and M.P. Dyban. Investigation of the Temperature Fields in the Hubs of Turbine Rotors by Means of the Thermal-Analogy Method 3

On the basis of a theoretical analysis of the system of equations describing the temperature field of a blade root, the authors present a method for taking into account the thermal resistance of the blade stems. This method may be used for calculations of steady-state heat conditions as well as unsteady-state conditions. 26

Doroshenko, A.M. Simple Calculation Method for a Laval Nozzle. The author presents the results of an experimental study of the rate of heat transfer during the condensation of steam. A detailed description of the experimental apparatus and the methods employed is given, as well as a qualitative description of the physical phenomena involved in the process of condensation on the basis of the results obtained. 32

Zemlin, M.V. Methods for Investigation and the Physics of the Process of Heat Transfer During the Condensation of Steam. Polubinskiy, V.I. Relative Velocity of Steam in the Case of High Steam Content of a Two-Phase Flow 43

Kozlov, G.A., and Z.V. Smilek. Investigation of the Heat and Mass Exchange in a Model of a Ventilator-Type Cascade Water Cooler 49

Kozlov, G.A., and M.N. Guk. Investigation of a Model of a Mine-Shaft Air Cooler With Kettle-Type Atomization of the Coolant. The authors present the results of an experimental study of a model of a mine-shaft air cooler. Results are presented of the effects of the degree of wetness, the velocity of the air, wet and dry bulb temperatures, and other parameters involved in the cooling process. 60

Satunin, V.L. Investigation of Heat-Exchange Processes in Evaporator-Cooling Equipment for Crane-Operator Cabs in Warm Sheds With High Temperatures 73
The author describes an evaporative cooler for a crane operator's cab and presents a study of the evaporative cooling process. The heat calculation of the equipment is treated, and attention is given to the transmission of radiant heat through the glass windows under different cooling conditions. 73

AUTHORS: Chernobyl'skiy, I. I. Doctor of Technical SOV/64-58-4-14/20
Sciences, Semilet, Z. V., Candidate of
Technical Sciences

TITLE: The Investigation of the Coefficients of the Heat Emission
of the Spray Heat Exchanger on the Sprayed Surface
(Issledovaniye koeffitsiyenta teplootdachi orositel'nogo
teploobmennika so storony orosheniya)

PERIODICAL: Khimicheskaya promyshlennost', 1958, Nr 4, pp. 249-252
(USSR)

ABSTRACT: The heat transfer from the outer surfaces of the spray
liquid of the above mentioned heat exchangers have been
little investigated until now; this makes difficult an
exact calculation and a design of this type of heat
exchangers. In the case of a slow motion of the air the
heat transfer from the wall to the spray liquid plays
the main role; the equation by Adams (Ref 21) and that by
Floeg (Ref 22) are recommended for the calculation of the
coefficient of heat transfer to the spray liquid. As,
however, the two formulae do not yield identical results
the authors carried out laboratory investigations with a

Card 1/2

The Investigation of the Coefficients of the Heat Emission of the Spray Heat Exchanger on the Sprayed Surface SOV/64-58-4-14/20

model. They investigated mainly the hydrodynamics of the flowing-off of the thin film along the surface of the horizontal tube. The experiments carried out among other things showed that a change of the diameter of the tube does practically not influence the flow character of the film and the heat transfer coefficient; in this connection the authors give several data. They found that for the intensification of the heat exchange process from the external surface the following is necessary: 1. A regular use, 2. An operation at an optimum wetting density, and 3. The optimum wetting density. There are 5 figures, 1 table, and 22 references, 19 of which are Soviet.

1. Heat exchangers--Performance 2. Heat transfer--Mathematical analysis 3. Liquids--Heat transfer 4. Thin films--Thermodynamic properties

Card 2/2

sov/81-59-16-57334¹

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 16, pp 247-248

AUTHORS: Kremnev, O.A., Semilet, Z.V.

TITLE: The Investigation of the Heat- and Mass-Transfer in the Model of a Fan-Type Grid Water Cooler

PERIODICAL: Sb. tr. In-ta teploenerg. AN UkrSSR, 1958, Nr 14, pp 49-59

ABSTRACT: The heat- and mass-transfer has been investigated in a horizontal refrigerator with a chessboard-type arrangement of triangular grids through which air is blown lengthwise. The refrigerator was a chamber of rectangular cross section 500 x 600 mm and 1,700 mm long in which 4 rows of horizontal wooden bars are placed of triangular cross section with a side of 70 mm; the distance between the bars in the row is 140 mm and between the rows 100 mm. The water with a temperature of 30 - 50°C entered from above from a distributor, the openings in which were placed over the bars of the upper row and the air with a temperature of 17 - 30°C and a relative humidity of 50 - 100% was blown along the bars by a fan, interacting with the water flowing down. The degree of irrigation in the experiments changes in the range 0.5 - 2.5 kg water per 1 kg air. The resistance of the refrigerator at an air speed $W = 2.6$ m/sec was ~ 0.7 mm water

Card 1/2

SOV/81-59-16-5733⁴

The Investigation of the Heat- and Mass-Transfer in the Model of a Fan-Type Grid Water Cooler

column (in the conducted experiments $W = 1.2 - 2.6 \text{ m/s-c}$). The general conditional volume coefficient of heat transfer referring to the difference of the partial pressures of water steam over the surface of water and in air $K_{\Delta p}$ (kcal/m³hr mm mercury column) is expressed by the empiric equation: $K_{\Delta p} = 600 W^{0.85} \mu^{0.45}$; its values amounted to $K_{\Delta p} = 434 - 1,902$. The coefficient of mass-transfer from the water to the air, which is expressed by the latent heat of vapor formation in heat units, β (kcal/m³ hour mm mercury column) is determined by the empiric equation: $\beta = 540 W^{0.85} \mu^{0.45}$. The deviations of the experimental data from the cited equations is in the range of 20%.

Yu. Petrovskiy.

Card 2/2

NAZARCHUK, M.M.; SEMILET, Z.V.

lateral fluid-film flow about a pipe. Zbir.prats' Inst.
tepl.AN USRS no.18:85-89 '60. (MIRA 14:12)
(Pipe-Hydrodynamics)

SEMILET, Zinaida Vasil'yevna; ARONOV, I.Z., kand. tekhn. nauk, retsen-
zent; NIKIFOROVA, R.A., inzh., red.; GORNOTAYPOL'SKAYA, M.S.,
tekhn. red.

[Heat exchangers equipped with spray coolers used in the chemical
industries] Orositel'nye teploobmenniki khimicheskikh proizvodstv.
Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit. lit-ry, 1961. 110 p.
(MIRA 15:1)

(Heat exchangers)

53916

S/066/62/000/001/003/004

DO41/D113

26.2181
AUTHORS:

Semilet, Z.V., Candidate of Technical Sciences, and Butskiy,
N.D., Engineer

TITLE:

Investigation of the heat emission and resistance of a
corrugated fin in a longitudinal flow

PERIODICAL:

Kholodil'naya tekhnika, no. 1, 1962, 13-16

TEXT: The authors investigated the heat emission and resistance of a
corrugated fin in order to determine the best version of such a fin. A
compact steel fin was cut to its base, and the obtained elements bent so
that the opening angle had a maximum value at the summit and was zero at the
base. The tests were carried out in an open-type wind tunnel 33 x 13 mm in
cross-section, 3.5 m long. The air flow was generated by a ventilator with
a capacity of 50 kg/hour. The following results were obtained: (1) A corru-
gated fin with an opening angle of 5° has a 45% larger heat emission than a
smooth fin; an increase in the opening angle from 5 to 45° has no practical
effect on the heat-emission intensity; (2) the boundary layer became turbu-

Card 1/2

32913

S/066/62/000/001/003/004
D041/D113

Investigation of the heat ...

lent when flowing from one element of the fin to the other; at an opening angle of 45° , an additional flowing-over of the air was observed; (3) a corrugated fin with an opening angle of 5° has, on the average, a 14% larger resistance than a smooth fin; an increase in the angle results in a sharp increase in the resistance, i.e. at 45° by 75 to 225%. It is recommended not to use an opening angle of more than 5° , since this does not essentially increase the heat emission coefficient but considerably increases the resistance. There are 3 figures and 2 references: 1 Soviet-bloc and 1 non-Soviet-bloc. The English-language reference is: W.M. Kays, A.L. London, Compact Heat Exchangers, 1955. ✓

ASSOCIATION: Institut teploenergetiki Akademii nauk USSR (Institute of Heat and Power Engineering of the Academy of Sciences of the UkrSSR).

Card 2/2

KREMNEV, O.A. [Kremn'ov, O.O.]; SEMILET, Z.V. [Semyliet, Z.V.]; BUTSKIY,
N.D. [Buts'kyi, M.D.]

Investigating the heat loss and resistance of elements of finned
laminar heat exchangers with perforated and corrugated fill racks.
Dop. AN URSR no.2:196-200 '62. (MIRA 15:2)

1. Institut teploenergetiki AN USSR. Predstavleno akademikom
AN USSR I.T.Shevtsom [Shvets', I.T.]
(Heat exchangers)

KREMNEV, O.A. [Kremn'ov, O.O.]; SEMILET, Z.V.; BUTSKIY, N.D. [Buts'kyi, M.D.]

Study of heat emission and resistance of finned lamellar heat exchangers
with grid-type perforated caps having recurved rims. Zbir. prats' Inst.
tepl. AN URSR no.24:14-23 '62. (MIRA 16:3)

(Heat exchangers)

KREMNEV, O.A. [Kremn'ov, O.A.]; SEMILET, Z.V. [Semylit, Z.V.]

Heat transfer and resistance of units of finned plate-type
regenerators of gas turbine plants. Zbir. prats' Inst. tepl.
AN URSR no.22:3-10 '61. (MIRA 16:6)

(Heat-Transmission)
(Gas turbines)

BODNYA, M.D.; BARANOVSKAYA, G.M.; SEMILETKOVA, I.N.

Refining rosin by premelting. Lakokras. mat. i ikh prim. no.5:
80-81 '61. (MIRA 15:3)

1. Tashkentskiy lakokrasochnyy zavod.
(Gums and resins)

Dissertation: "Electronographic Investigation of the Structure of Thin Layers of Some Semiconductive Alloys," Cand Phys-Math Sci, Inst of Crystallography, Acad Sci USSR, Moscow, 1953. Referativnyy Zhurnal--Khimiya, Moscow, No 7, Apr 54.

SO: SUM 284, 26 Nov 1954

SEMILETOV, S.A.

Electronographic investigations of the structure of sublimated
layers of the composition of Bi-Se and Bi-Te. Trudy Inst.kristal.
no.10:76-83 '54. (Selenium) (Tellurium) (Bismuth) (MIRA 8:5)

SEMILITOV, S. A.

"Electromographic Study of the Structure of Sublimated Films of Bi-Se and Bi-Te Compound".

Tr. in-ta Kristallogr. AN SSSR, No 10, pp 179-196, 1954

Analysis was carried out of thin films of Bi alloyed to Se or Te around 10^{-6} cm thick, obtained by deposit in vacuum of the initial compounds or the ready alloys Bi_2Se_3 . A new alloy was established in the Bi-Se system and its chemical composition (Bi_3Se_4) and its structure determined. It was found, that in variance to previous data, Bi selenides are of variable compound and Se solution in Bi provokes and increase of the lattice period. (RZhFiz, No 10, 1955)

SO: Sum No 812, 6 Feb 1956

SEMILETOV, S.A.

Electronographic study of the structure of sublimated selenium
and tellerium. Trudy Inst.krist.no.11:115-120 '55. (MIRA 9:6)
(Selenium) (Tellurium)

SEMILETOV, S.A.

Electronographic study of the cadmium-tellurium alloy system.
Trudy Inst.krist. no.11:121-123 '55. (MLRA 9:6)
(Cadmium alloys) (Tellurium alloys)

USSR/Physics - Solid state

Card 1/1 Pub. 153 - 14/26

Author : Semiletov, S. A.; Pinsker, Z. G.

Title : Oxidation of Bi_2Se_3 and Bi_2Te_3 specimens during annealing in air

Periodical : Zhur. tekhn. fiz., 25, No 13 (November), 1955, 2336-2338

Abstract : According to the literature (A. Gibbison, Proc. Phys. Soc., 63-A, 176, 1950) the heating of Bi_2Se_3 and Bi_2Te_3 in air or in atmosphere of oxygen (temperature training) strongly influences their photoelectric and other properties. In the present article the authors discuss an electrographic investigation of the structure of thin layers (about 1 to 10 millimicrons) of Bi_2Se_3 and Bi_2Te_3 heated after sublimation in air at temperature of about 230°C for 5-40 minutes. They establish that heating in air results in the formation of a certain new phase having cubic face-centered lattice with period 5.5-5.6 kX, corresponding to the formula BiO . The authors present results of electronograms obtained from a series of Bi_2Se_3 specimens. They conclude that at higher temperatures the further oxidation of specimens converts BiO to Bi_2O_3 possibly, although they have not succeeded in tracing this process since the entire substance evaporates from the base at higher temperatures. Two references: both Western (J. Mellor, Comprehensive Treatise on Anorganic and Theoretic Chemistry, IX, London, 1947; op. cit.).

Submitted : May 25, 1955

SEMILETOV, S. A.

USSR/Chemistry - Crystallography

Card 1/1 Pub. 22 - 13/47

Authors : Semiletov, S. A., and Pinsker, Z. G.

Title : Electronographic study of Bi-Se alloys

Periodical : Dok. AN SSSR 100/6, 1079-1082, Feb 21, 1955

Abstract : An electronographic study of a Bi-Se system revealed the existence of two rhombohedral phases and one cubic one in the system. These phases were observed in samples prepared by sublimation of the alloy corresponding in composition to Bi_2Se_3 . Measurement of many electronograms showed that the lattice periods of these compounds do not remain constant but vary depending upon the composition. Five references: 2 USSR, 1 USA, 1 Italian and 1 German (1930-1951). Illustrations.

Institution : Academy of Sciences USSR, Institute of Crystallography

Presented by: Academician N. V. Byelov, July 15, 1954

SEMILETOV, S. A.

B-5

USSR/Physical Chemistry. Crystals.

Abs Jour: Ref Zhur-Khimiya, No 5, 1957, 14489

Author : S. A. Semiletov, Z. G. Pinsker

Inst :

Title : An Electron Diffraction Study of the Degree of Perfection of Germanium Monocrystals

Orig Pub: Kristallografiya, 1956, 1, No 2, 209-213

Abstract: A study was made of the perfection of the structure of the outer layer of polished and cleansed H_2O_2 mono-crystals Ge. On electron diffraction pictures of the polished crystals there were observed Debye rings and spots which proves that in polishing Ge there occurs a formation of separate blocks in the outer layer, rotated with respect to one another at an angle $\sim 2-30^\circ$ (mosaic) and the extraction from the surface of minute crystals. In the process of cleansing there takes place a gradual removal of this layer with damaged structure and Kikuchi lines appear on the electron diffraction pictures whose

Car Card 1/2

Semiletov, S.A.

USSR / Structural Crystallography.

E-3

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9205

Author : Semiletov, S.A.

Title : Electron-Diffraction Determination of the Structure of Antimony Telluride.

Orig Pub : Kristallografiya, 1956, 1, No 4, 403-406

Abstract : An electron diffraction investigation was made of the structure of Sb_2Te_3 . Instead of the previously proposed structure with a statistical arrangement of the atoms of Sb and Te, a structure of the tetradimite type ($\text{Bi}_2\text{Te}_2\text{S}$) was established. The lattice periods (hexagonal) are $a = 4.24 \pm 0.02$ kX and $c = 29.90 \pm 0.10$ kX. The cell contains six antimony and nine tellurium atoms. The atoms occupy positions (a) and (c), Fedorov group $R\bar{3}m$ with parameters $Z_{\text{Sb}} = 0.400$, $Z_{\text{Te}} = 0.211$.

Card : 1/1

SEMILETOV, S.A.

Electronographic investigation of the structure of films of germanium obtained by vacuum sputtering. *S. A. Semiletov*
Semiletov (Inst. Cryst., Acad. Sci. U.S.S.R., Moscow).

Kristallografiya 1, 542-5 (1956).—Ge was evapd. on to a wide range of heated substrates under a variety of conditions, and the resulting films were examd. electronographically. Polycryst. films were obtained on glass, polished quartz, and corundum at 400°, and further heating to 900° for 1-3 hrs. had no effect. Rapid evapn. on to graphite, calcite, and Si at 550-600° gave textures with (110) and (100) parallel to the layer; on to glass at 520° (111) and (100); and on to corundum at 700-800° (100). Point electronograms were obtained from layers on calcite at 520-600° where (111) and sometimes (100) of Ge was parallel to (1011) of calcite. For mica (111) and more rarely (110) of Ge were parallel to the sheet. Evapn. was done also on to freshly cleaved and etched crystals of Ge. High rates of evapn. produced more perfect crystn. Amorphous layers can be formed on Ge even up to 370°.

A. L. Mackay

myi

SEMILETOV, S. A.

Category : USSR/Solid State Physics - Structural crystallography

E-3

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1127

Author : Pinsker, Z.G., Semiletov, S.A., Belova, Ye.N.

Inst : Institute of Crystallography, USSR Academy of Sciences

Title : Electron Diffraction Determination of the Structure of $Tl_2Sb_2Se_4$

Orig Pub : Dokl. AN SSSR, 1956, 106, No 6, 1003-1006

Abstract : Electron diffraction was used to determine the structure of $Tl_2Sb_2Se_4$. The specimens for the investigation were prepared by volatilizing in vacuum an alloy of the above composition on a celluloid film with subsequent heating at 100° for 30 -- 40 minutes. The textures on the electron diffraction patterns establish the following rhombic cell: $a=4.18$, $b=4.50$, $c=12.00$ Å; Fedorov Group D_{2h}^{19} ; $Z=1$; $V=7.08$. The coordinates of the atoms were determined by using the Patterson and Fourier synthesis: Sb in (a); Tl in (c); Se in (h), $y=0.500$, $z=0.272$. The Tl and Sb atoms form centered flat grids with distances of 3.07 Å between the Tl and the Sb. Zigzag shaped chains of Se atoms are placed between two neighboring grids, parallel to the x axis, with a distance Se -- Se of 2.15 Å and a valence angle of 152° .

Card : 1/1

SEMILETOV, S.A.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1749
AUTHOR KUROV, G.A., SEMILETOV, S.A., PINSKER, Z.G.
TITLE The Investigation of Monocrystalline Germanium Films obtained
by Evaporation in the Vacuum.
PERIODICAL Dokl. Akad. Nauk, 110, fasc. 6, 970-971 (1956)
Issued: 1 / 1957

The present work discusses some electric measurements and the investigation of the structure of such germanium films. The samples were produced in the vacuum ($\sim 10^{-5}$ mm torr) by the evaporation of n- and p-germanium samples with a specific resistance of 2-30 ohm.cm. Condensation took place either on a germanium monocrystal surface which was previously pickled and ground with hydrogen peroxide, or on the cleavage face of monocrystals. The temperature of the base amounted to from 450 to 900° during the process of steaming on. The thickness of the film was 20 to 30 microns. By means of electronographic investigations it was found that, on the occasion of the production of monocrystalline films with complete structure, sublimation must be carried out on monocrystals which have been heated to more than 750 - 800°. In the case of lower precipitation temperatures (500 to 700°) films are formed with the structure of a mosaic-like monocrystal. In the electronograms of the films precipitated on the monocrystals heated to more than 750 - 800° sharp lines and stripes are visible, which indicates the lack of a mosaic-like structure in the samples. The electric properties of such samples with a thickness of ~ 10 to 20 microns ought, in reality, not to differ considerably from the properties of a massive sample. However, measurements showed

SEMILETOV S.A.

Distr: 4E43/4E2c/4E4c/4E3d

Electric properties and real structure of single-crystal germanium films obtained by evaporation in vacuum. G. A. Kurov, B. A. Semiletov, and Z. G. Pinsker. *Kristallografiya* 2, 60-63 (1967). Vacuum-vaporized Ge, condensed on the surface of single-crystal Ge, pre-heated to approx. 800°, was investigated for its elec. properties and microstructure. Electron- and visible light microscopic exam. of the condensed film, 20-30 μ thick, and about 4×10 sq. mm. in area, revealed single-crystal structure, whereas Ge, sputtered in vacuum on a glass surface, consisted of fine crystals, 10^{-4} - 10^{-5} cm. in diam. Elec. resistance of the polycryst. Ge film on glass amounts to $2-7 \times 10^{-3}$ ohm/cm. on corundum $1-5 \times 10^{-1}$ ohm/cm., both at room temp. Heat-treatment up to 900° did not substantially change the resistivity. Elec. resistance of the single-crystal Ge film was 2.2×10^{-3} ohm/cm, and the Hall-e.m.f. less than 10^{-3} v. The cond. was of the hole type, with the diffusivity amounting to 1.6×10^8 sq. cm./v. sec. Electron micrographs of collodion replicas of the single-crystal Ge film at 9900 \times magnification revealed a regular net of etching figures in form of diamonds with 60 and 120° angles. The etching figures of the crystal face, which was coated with the film, were at random. The symmetry of the single-crystal film on the (111) face of the Ge crystal coincided with the symmetry of the gliding lines resulting from the deformation of the crystal, bent around the [110] direction. After bending, the cond. of the single-crystal film decreased considerably. Anomalous elec. properties of the film result from its real structure defects, not detectable by electron microscopic exam.

E. Ryzhenish

AUTHOR: Semiletov, S.A. and Rozsival, M. 70-2-15/24
TITLE: Electronographic investigation of films of InSb. (Elektro-
nograficheskoye issledovaniye plenok InSb)
PERIODICAL: "Kristallografiya" (Crystallography), 1957, Vol.2,
No.2, pp. 287-288 (U.S.S.R.)

ABSTRACT: Attempts were made to prepare films of InSb by vacuum
evaporation of the two metals from two independent vaporisers
on to celluloid and crystals of NaCl. This technique gave
specimens of variable composition. Finally, evaporation of
InSb alloy gave films of InSb but the first layers were of Sb
and the last of InSb + In. A powder electronogram of InSb
was completely indexed on the basis of the existence of two
InSb phases one with the zinc blende structure with $a = 6.46 \text{ \AA}$
and the other with the wurtzite structure with $a = 4.56$ and
Card 1/1 $c = 7.46 \text{ \AA}$. (n.b. $4.56 \times 2^{1/2} = 6.46$ and $7.46 \times 1/2.3^{1/2} =$
6.46). There are 1 table, 1 plate and 1 Slavic reference.

ASSOCIATION: Institute of Crystallography, Ac.Sc. USSR (Institut
Kristallografii AN SSSR)

SUBMITTED: February 7, 1957.
AVAILABLE: Library of Congress

SEMILETOV, S.A.

SEMILETOV, S.A., kandidat fiziko-matematicheskikh nauk.

Achievements of Soviet electronography; conference in Moscow.
Vest.AN SSSR 27 no.4:112-114 Ap '57. (MLRA 10:5)
(Electron diffraction examination)

SEMILETOV, S. A.

SEMILETOV, S.A., kandidat fiziko-matematicheskikh nauk.

Conference on electronography. Priroda 46 no.5:111-112 My '57.
(MIRA 10:6)

1. Institut kristallografii Akademii nauk SSSR (Moskva).
(Moscow--Electronography--Congresses)

70-3-3-5/36

AUTHOR: Semiletov, S.A.

TITLE: An Electronographic Determination of the Structure of InSe
(Elektronograficheskoye opredeleniye struktury InSe)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 3, pp 288 - 292
(USSR).

ABSTRACT: The full determination of the crystal structure of InSe has been carried out. The layer-type cell is hexagonal₄ with $a=4.04$ and $c=16.90$ KX $n=4$ and space group $C6/mmc = D_{6h}^2$.

In atoms lie in 4(f) positions with z parameter 0.157 and the Se atoms also in 4(f) positions with $z=0.102$. The structure is made up of quadruple layer blocks with the layer sequence SeInInSe. These blocks are themselves stacked hexagonally with the layer sequence BCBCBCBC... (GaS-type). The diffuseness of certain reflections in the electronogram indicates errors in the stacking of the blocks some of which can occur in the sequence ABC (cubic packing). The specimens were prepared as thin films by the evaporation of an alloy mixed with the composition InSe onto layers of celluloid or crystals of NaCl. If the NaCl was at room temperature only an amorphous structure was obtained but this layer was then annealed at 300°C to crystallise it. GaSe can occur in two forms,

Card 1/3

70-3-3-5/36

An Electronographic Determination of the Structure of InSe

hexagonal and rhombohedral and a rhombohedral structure was earlier observed for InSe. It is possible that this rhombohedral modification may be stable for macroscopic specimens and the other, hexagonal, form stable in very thin layers. MgO was used as an internal standard for cell size determination. The structure was deduced by analogy with that of GaSe but some uncertainty remained because of the similarity of the scattering factor of Ga and Se. InSe gave the possibility of removing this and an F^2 synthesis was calculated along the line (0,0,z). This gave distinct and interpretable peaks leading to fair values of the parameters. It was possible, because of the simplicity of the structure to plot curves of the reliability factor against small variations of the parameters. The best parameters were chosen in this way giving an R value of 27%. The shortest bond distances are

In-In = 3.15, In-Se = 2.50 and Se-Se = 4.16 KX.
The disorder observed resembled that found in Co where reflections with $h-k = \frac{1}{2} 3n$ are diffuse. In cobalt reflections with $l=2n$ are three times as strongly diffused as are those with $l = \frac{1}{2} 2n$ but here reflections with $l = \frac{1}{2} 2n$ are

Card 2/3

70-3-3-5/36

An Electronographic Determination of the Structure of InSe

significantly diffuse and reflections with $l \neq 2n$ and $h-k \neq 3n$ are absent. The layer of InSe observed may however be only one or two unit cell heights thick so that two dimensional scattering may be occurring reducing the significance of observations on the layer sequence.

Acknowledgments to Professor Z.G. Pinsker.

There are 4 figures and 9 references, 2 of which are Soviet, 4 German and 3 English.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography, Ac.Sc. USSR)

SUBMITTED: February 25, 1958

Card 3/3

SEMILETOV, Stepan Alekseyevich

"Electron Diffraction Study of the Structures of Semi-conductors"

a report presented at Symposium of the International Union of
Crystallography Leningrad, 21-27 May 1959


24(2)
AUTHOR: Semiletov, S. A., Candidate of Physical and Mathematical
Sciences SOV/30-59-8-12/56

TITLE: International Meeting on Crystallography

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 8, pp 56 - 58 (USSR)

ABSTRACT: The 40th anniversary of the death of Ye. S. Fedorov, an ~~out-~~
~~standing~~ Russian crystallographer and creator of the space
groups, was celebrated on May 22, 1959. On this occasion
the International Association of Crystallographers (MSK)
and the Academy of Sciences, USSR convened the traditional
Fedorov Meeting on Crystallography in Leningrad. More than
500 Soviet and about 50 foreign crystallographers **accepted**
the invitation of the Academy of Sciences, USSR. In plenary
meetings and symposia more than 100 reports were heard which
were devoted to problems of mathematical crystallography and
crystallochemical analysis, the theory of the structure analy-
sis of crystals and of heat motion (teplovoye dvizheniye)
of their atoms as well as to the crystallochemistry of in-
organic and organic compounds. J. Viar (France), President
of the MSK, opened the Meeting. Soviet scientists held the

Card 1/3



SOV/30-59-8-12/56

International Meeting on Crystallography

following reports: N. V. Belov, Vice-president of the MSK, spoke about the 230 space groups obtained by Ye. S. Fedorov. N. M. Bashkirov showed that it is possible to represent all the 230 symmetry groups of Fedorov by stereohedrons. B. N. Delone and N. N. Sandakova reported on the theory of stereohedrons. I. I. Shafranovskiy dealt in his report with further ways of developing Fedorov's crystallochemical analysis. I. S. Zheludev spoke about the symmetry of axial and polar tensors of the second order. B. K. Vaynshteyn and I. M. Rumanova reported on function projections of the electron density. St. Novák (Czechoslovakia), N. P. Trifonov and B. M. Shchedrin dealt with the use of machinery and the automation of computations in structural analysis. Subject of the reports by L. S. Zevin, Z. K. Zolina, B. V. Zubenko, D. M. Kheyker, and M. M. Umanskiy was a precise determination of the parameters of the elementary cell and the diffractometric methods. M. I. Millionova and N. S. Andreyeva dealt with the structural analysis of complex objects. A. I. Kitaygorodskiy's report dealt with problems of organic crystallochemistry; the reports by O. V. Starovskiy, Yu. T. Struchkov, T. L. Khotsyanova with the structural analysis of organic crystals, and of

Card 2/3

International Meeting on Crystallography

SOV/30-59-8-12/56

inorganic crystals the reports by V. I. Simonov, M. A. Poray-Koshits, G. B. Bokiy. A. S. Povarennykh and Z. V. Zvonkova spoke about some general problems of crystallochemistry. I. S. Rez described the crystallochemistry of the piezoelectric elements. G. S. Zhdanov, S. A. Sonin, and I. S. Zheludev dealt with the crystallography of Seignette dielectrics. X-ray investigations of metals and alloys were the subject of reports by V. I. Iveronova, Ya. S. Umanskiy, and Yu. S. Terminasov. Z. G. Pinsker spoke about some results of electronographic investigation of nitrides and carbides of a number of metals. B. K. Vaynshteyn and Z. G. Pinsker reported on the further development of the method of electronographic structural analysis. N. M. Popov and B. B. Zvyagin spoke about results and prospects of using the diffraction of high-energy electrons. P. A. Akishin reported on the investigations of the molecular structure in vapors. The meetings of the Conference were concluded with the film "The Formation of Crystals" presented by A. V. Shubnikov and V. F. Parvov.

Card 3/3

SOV/70-4-3-20/32

AUTHORS: Semiletov, S.A. and Man, L.I.

TITLE: Electronographic Investigation of the Structures of Thin Films of TlBiSe_2 and TlSbS_2

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 3, pp 414 - 417 (USSR)

ABSTRACT: Films of TlBiSe_2 and TlSbS_2 were prepared by vacuum evaporation of the alloys themselves onto rock salt or collodion substrata. Two types of pattern were obtained when TlBiSe_2 films were examined in the electronograph: after rapid heating a pattern with a few broad lines; and after annealing at 200°C a pattern with many sharp lines. The second has not yet been indexed but the first represents a cubic face-centred cell with $a = 6.18 \pm 0.02 \text{ \AA}$, $d_{\text{obs}} = 8.25 \text{ g/cm}^3$ gives $Z = 2$. The pattern is of the NaCl type but as there are no two-fold positions, Tl and Bi must be distributed statistically. This seemed improbable and 20 independent reflexions were photometered. The three-dimensional sections of the potential

Card1/3

SOV/70-4-3-20/32

Electronographic Investigation of the Structures of Thin Films of
 TlBiSe_2 and TlSbS_2

distribution $\varphi(xy\ 0)$ and $\varphi(xxx)$ were calculated. Films of TlSbS_2 gave oblique texture electronograms with periods a varying between 5.87 and $5.94 \pm 0.02\ \text{\AA}$, according to composition. Calculation of the Harker section $P(xxx)$ confirmed that the structure was of the NaCl type. When S.F.s were calculated reliability indices of $R = 18\%$ and $R = 22\%$ were obtained for TlBiSe_2 and TlSbS_2 , respectively. The volume of the TlBiSe_2 unit cell ($238\ \text{\AA}^3$) is a little bigger than that of the orthorhombic compound TlSbSe_2 ($226\ \text{\AA}^3$) which has $a = 4.18$, $b = 4.50$, $c = 12.00\ \text{\AA}$. It is expected that the second modification of TlBiSe_2 will be ordered. A series of some 11 compounds, $\text{A}^{\text{I}}\text{B}^{\text{V}}\text{X}_2^{\text{VI}}$ have this statistical NaCl-type structure. There are 6 figures, 2 tables and 8 references, of which 5 are Soviet and 3 English.

Card2/3

SOV/70-4-3-20/32
Electronographic Investigation of the Structures of Thin Films of
TlBiSe₂ and TlSbS₂

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the Ac.Sc., USSR)

SUBMITTED: January 28, 1959

Card 3/3

AUTHOR: Semiletov, S.A.

SOV/70-4-4-32/34

TITLE: ~~On the~~ Influence of Certain Impurities on the Structure of Thin Plates of Selenium

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 4, pp 629-631 (USSR)

ABSTRACT: The influence of impurities of In and Tl on the crystallisation of amorphous layers of Se has been studied. Specimens were prepared by evaporating In (or Tl_2Se) and Se onto a celluloid film from separate evaporators (Vekshinskiy's method). Part of the film formed was Se with In impurity and part In with Se impurity. The layers were annealed at 120 °C for 1-2 hours and became crystalline. Electronograms showed highly developed textures. They corresponded with the formation of platy crystals of hexagonal Se with the basal planes strongly developed. These are oriented parallel to the substrate which is not the usual orientation. The impurity (In) seems to act by breaking the spiral chains and rings of the amorphous phase, thus producing Paster crystallisation. Tl acts in the same way. Other workers (Ref 3) obtained crystalline Se from amorphous by local heating in the electron beam;

Card1/3

SOV/70-4-4-32/34

On the Influence of Certain Impurities on the Structure of Thin
Plates of Selenium

this is analogous to the introduction of an impurity in that it also breaks Se-Se bonds and they reported the same orientation. Specimens of Bi_2Tl_3 deposited crystallites of Te on heating in air which were oriented with basal planes parallel to the substrate and not prismatic faces as is usual. The work quoted reported (beside two monoclinic and one hexagonal forms of Se) two other modifications of Se- α , with a primitive cubic cell with $a = 2.97 \text{ \AA}$ and β , with a face-centre cubic cell with $a = 5.755 \text{ \AA}$. The present authors think the latter may be Cu_2Se , although this possibility is discounted by the authors of the DAN paper. The existence of the α -modification is probable, the production of separate Se atoms occurring by electron bombardment, as observed above. There are 2 figures and 5 references, of which 4 are Soviet and 1 English.

Card2/3

SOV/70-4-4-32/34

On the Influence of Certain Impurities on the Structure of Thin Plates
of Selenium

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the Ac.Sc., USSR)

SUBMITTED: March 18, 1959

Card 3/3

SEMILETOV, S. A.

0.0000
501770-4-3-34/30

AUTHORS: Belov, N. V., Vaynshteyn, B. K., Kityayevskiy, A. I.,
Porey-Koshits, M. A., Semiletov, S. A., Shetali, N. N.
TITLE: International Pedorov Session on Crystallography Held in
Leningrad

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 5, pp 796-900 (USSR)
ABSTRACT: The International Union of Crystallography (IUC) and the
Academy of Sciences of the USSR convened an International
Session (in honor of the death of the Great Russian crystallo-
grapher V. S. Fudorov). The session, attended by 600
scientists from the USSR, U.K., France, U.S., Japan,
Germany, Czechoslovakia, Netherlands, Canada, Australia,
and other countries, was held in Leningrad from May 21
to 27, 1959. The major reports were presented to the
plenary sessions and some 100 reports to 2 panels. The
subject of the 1st panel was crystal-chemical analysis
and that of the 2nd panel electron was diffraction studies.

Card 1/3

The reports to the plenary sessions were presented by the
following Soviet scientists: K. V. Belov (VP of IUC),
V. I. Simonov, V. A. Frank-Kamenetskiy, G. B. Bokiy,
M. A. Porey-Koshits, L. Kovsky, Ye. A. Shagum, V. N.
Levina, Yu. S. Pechenova, Sh. Kh. Yar-Nikhamadov, Ya.
S. Umanitskiy, V. I. Kuznetsov, L. S. Palatnik, A. S.
Ye. I. Oladsky, Z. G. Plisker, G. S. Zharov, A. S. Rez.
Sonic, I. S. Zhurav, I. G. Ismailov, K. Semakovich,
A. V. Stepanov, I. B. Porovskiy, A. S. Pov. Stavrovskiy,
Z. V. Zakharenko, A. I. Kitaygorodskiy, K. Vaynshteyn, I. M.
R. N. Kovaleva, V. L. Indenbom, I. M. Shtrunovskiy, H. P.
Tefonov, B. M. Shchedrin, B. M. Koshker, M. M. Uman-
skiy, A. V. Shubnikov, V. P. Petrov, and V. V. Simonov.
The reports of the U.S. crystallographers were presented
by R. Pepinsky, D. Harwig, H. D. Donay, and V. Parrinello.
J. Donohue, G. Donnay, H. D. Donay, and V. Parrinello.
Six reports were presented by British crystallographers,
2 by German, 2 by Czech, 2 by Dutch and 1 each by

Card 2/3

French, Canadian, and Japanese crystallographers. The
session admitted five new member nations and the IUC com-
menced its newly appointed officers, including the
editor of "Acta Crystallographica", A. J. C. Wilson,
appointed G. B. Bokiy as head of the subcommittee for
abstracting the Soviet publications in crystallography,
planned Japan to be the site of the next interim, and
Italy or Israel of the next congress, and solved some
other business matters.

July 1, 1959

SUBMITTED:

Card 3/3

24,700

S/070/60/005/02/002/003
E132/E260

AUTHORS: Semiletov, S. A., and Man, L. I

TITLE: The Electron Diffraction Investigation of the Structures of Thin Films of Certain III^V-type Compounds and of Their Alloys

PERIODICAL: Kristallografiya, 1960, Vol 5, Nr 2, pp 314-315 (USSR)

ABSTRACT: Thin films of the arsenides and antimonides of Ga and In and of alloys of these compounds have been studied. The compounds or alloys as such were evaporated on to NaCl or celluloid substrates and were homogenised by annealing in vacuo. The compounds dissociate and the higher volatility of As and Sb tends to change the composition. The initial evaporation increases the concentration of As and Sb and the subsequent annealing decreases it again. GaAs and InAs evaporated on to NaCl heated to 400°C show the preferred orientation (100) parallel to (100) of NaCl and [100] parallel to [100] of NaCl. All lines from GaAs were indexed on the basis of a cubic cell with $a = 5.64 \pm 0.02 \text{ \AA}$. GaSb and InAs, however, showed lines extra to the cubic phase indicating a hexagonal phase. This has been found earlier for InSb (Krist., 2, 287-9, 1957)

Card 1/2

80186

S/070/60/005/02/002/003
E132/E260

The Electron Diffraction Investigation of the Structures of Thin Films of Certain A^{III}B^V-type Compounds and of Their Alloys

but not for GaSb, InSb, InAs nor AlSb. From relative line intensities the proportion of the hexagonal phase in InSb was estimated at 40 to 50%. InAs contained about 20% of the hexagonal phase and GaSb about 10%. The quasi-binary alloys of these compounds were examined:-
InAs - GaAs showed a continuous range of solid solutions with a from 5.64 to 6.05 \pm 0.02 Å. InSb - GaSb also showed a continuous range with a from 6.10 to 6.46 Å. For InSb - InAs limited ranges of solution were found. InAs occurred with a = 6.05 to 6.10 and InSb with a = 6.46 to 6.42 Å. Homogenisation could be produced by sufficiently long heating of thin films whereas in large specimens the diffusion coefficients would be far too low for this to be achieved. There are 7 references, 6 of which are Soviet and 1 German.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography, AS USSR)

SUBMITTED: October 31, 1959

Card 2/2

84119

9.4300 1035
1043

S/O70/60/005/005/004/017
E132/E360

AUTHOR: 1143 Semiletov, S.A.

TITLE: The Crystal Structure of the High-temperature
Modification of In_2Se_3

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 5,
pp. 704 - 710

TEXT: Among the $\text{A}_2\text{B}_3^{\text{III-VI}}$ compounds (Al, Ga, In with S, Se, Te)

the sulphide and selenide of indium are exceptions to the prevalence of the defect zinc blende structure. Hahn (Angew. Chemie, 65, 538, 1953) showed that In_2Se_3 had high and low-

temperature modifications, the latter of low symmetry and the former hexagonal with $a = 3.99$ and $c = 19.24 \text{ \AA}$. The high-temperature form is made by the rapid cooling of specimens heated for a long time to 800 deg. The low-temperature modification is formed after prolonged treatment at 600 deg. The $\alpha - \beta$ transformation is reversible and lies between 600 and 700 deg. Some authors have found a third powder pattern on heating In_2Se_3 in H_2Se . Conductivity measurements on single

Card 1/4

-84119

S/070/60/005/005/004/017

E152/E360

The Crystal Structure of the High-temperature Modification
of In_2Se_3

crystals showed the transition temperature to be at 200 deg and not as found by Hahn. Here, electronographic studies have been made of the graphite-like phase of In_2Se_3 . Specimens were made by the vacuum evaporation of In_2Se_3 onto NaCl or celluloid films. The main lines of the pattern could be indexed on a hexagonal cell with $a = 3.99$ and $c = 19.24$ but there were other weaker lines. Annealing on the NaCl substrate produced much sharper patterns. Patterns from the low-temperature α -modifications (specimens heated for two hours at 180 deg) showed both sharp and diffuse lines. The β -modification, the pattern of which was obtained after heating at 350-400 deg, gave sharp spots which could be indexed on a hexagonal cell with $a = 7.11 \pm 0.02$ and $c = 19.30 \pm 0.04 \text{ \AA}$. This gives approximately: $a_\beta = a_\alpha \sqrt{3}$ and $c_\beta = c_\alpha$. Working from the known cell contents of the cell of the α -form the cell of the β -form must contain 18 Se and 12 In atoms. As the indicated

Card 2/4

84119
S/070/60/005/005/004/017
E152/E360

The Crystal Structure of the High-temperature Modification of In_2Se_3

space groups are $C6_1$ or $C6_2$ it must be a six-layer structure. Patterson and Fourier syntheses were made with the observed reflexions and the following coordinates were obtained: 6 Se in $1/3, 0, 0$; 6 Se in $0, 1/3, 0$; 6 Se in $2/3, 2/3, 0$; 6 In in $1/3, 0, z$; 6 In in $0, 1/3, z$; where $z = 0.138$. The structure consists of close-packed Se atoms and In atoms lie in tetrahedral interstices in an ordered way following a six-fold screw axis. One of the modifications of Ga_2Se_3 has this structure. The interatomic distances are In-Se (top of tetrahedron) 2.67; In-Se (base of tetrahedron) 2.45; Se-Se (in layers) 4.12; Se-Se (tetrahedron edges) 4.02 Å. The differences between these distances are within the expected error of ± 0.16 . The structure is predominantly covalent.

Card 3/4

S/070/60/005/005/004/017⁸⁴¹¹⁹
E132/E360

The Crystal Structure of the High-temperature Modification of
 In_2Se_3

There are 6 figures and 8 references: 2 Soviet, 5 German
and 1 Japanese (in English).

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the AS USSR)

SUBMITTED: April 21, 1960

Card 4/4

20784

9.4300 (1150, 1151, 1164)

S/181/61/003/003/009/030
B102/B214

26.2421

AUTHOR: Semiletov, S. A.

TITLE: Electron diffraction study of the structure of thin films of indium selenide In_2Se_3

PERIODICAL: Fizika tverdogo teia, v. 3, no. 3, 1961, 746-753

TEXT: The crystallochemistry of semiconductors has become of particular interest lately. In_2Se_3 has also been investigated many times before but the results, particularly those relating to the α -modification, are conflicting. At least three modifications were found to exist: a graphite-like α -modification stable at room temperature, a β -modification stable over 200°C , and a γ -modification stable above $500\text{--}600^\circ\text{C}$. To obtain more accurate results, an electron diffraction study has been made of thin layers of indium selenide, and the results of the investigations are reported in this paper. The results are as follows: The compound In_2Se_3 has at least four different modifications: two hexagonal (α and β), one cubic (γ), and one monoclinic. The

Card 1/4

20784

S/181/61/003/003/009/030
B102/B214

Electron diffraction ...

crystal structures of the two hexagonal modifications were more closely investigated. 2) The α -modification of In_2Se_3 stable at room temperature shows a two-layer hexagonal packing of Se atoms (cell parameters: $a=16.00 \text{ \AA}$, $c = 19.24 \text{ \AA}$; space group: $C_6^2 - C6_3$; $Z = 32$) in which the main mass of In atoms is tetrahedrally arranged (In-Se separation: 2.51 \AA) and $1/16$ of them are octahedrally arranged; here, two layers of occupied sites alternate with one empty layer so that the layer structure is distinctly marked. The structure consists of five-layer packets SeInSeInSe which are held together only by weak van der Waals forces (Se-Se: separation 3.55 \AA). These packets lie perpendicular to the c-axis according to the law of hexagonal packing:

$\text{BbCcB CcBbC BbCcB} \dots$

$\text{B} \quad \text{C} \quad \text{B} \quad \dots$

in which some of the packets are arranged according to a rule differing from the above law, which leads to an indistinctness of the observed "reflexes". A consequence of this layer structure is that the crystals can be easily cleaved parallel to the basal plane. In spite of the apparent complexity,

Card 2/4

20784

S/181/61/003/003/009/030
B102/B214

Electron diffraction ...

the structure of α - In_2Se_3 is analogous to that of wurtzite (tetrahedral arrangement of the main mass of In atoms in the vacancies of a two-layer hexagonal packing). The β -modification of In_2Se_3 has also a two-layer packing of the Se atoms ($a = 7.11$, $c = 19.30$ Å; space group: $C_6^3-C6_5$; $Z = 6$) but differs from the α -modification in that all the In atoms are tetrahedrally arranged in vacancies (In-Se separation: 2.51 Å). The β - In_2Se_3 structure is a superstructure on the basis of the wurtzite structure. Its most significant difference from the α -modification lies in the fact that it has no layer structure; the In atoms are uniformly distributed. On α - β transition, In_2Se_3 shows a sharp decrease in electrical conductivity. This is connected with the fact that 1/16 of the In atoms make a transition from octahedral arrangement in the vacancies to a tetrahedral one, that is, from a p-electron binding to an sp^3 binding. There are 3 figures and 10 references: 4 Soviet-bloc and 6 non-Soviet-bloc.

Card 3/4

Electron diffraction ...

20784
S/181²/61/003/003/009/030
B102/B214

ASSOCIATION: Institut kristallografii AN SSSR Moskva (Institute of
Crystallography, AS USSR, Moscow)

SUBMITTED: May 30, 1960

Card 4/4

SEMILETOV, S.A.

Crystalline structure of the low-temperature modification of In_2Se_3 .
Kristallografiia 6 no.2:200-203 Mr-Ap '61. (MIRA 14:9)

1. Institut kristallografii AN SSSR.
(Electron diffraction examination)
(Indium selenide crystals)

24,7100 (1160 only)

25890
S/070/61/006/004/002/007
E021/E406

AUTHOR: Semiletov, S.A.

TITLE: The crystal structure of rhombohedral MoS_2

PERIODICAL: Kristallografiya, 1961, Vol.6, No.4, pp.536-540

TEXT: R.E.Bell and R.E.Herfert published results of an investigation of the structure of synthetic molybdenum disulphide (Ref.5: J.Amer.Chem.Soc., 79, 13, 3351-3355, 1957). It was established that the structure was different from that of the natural mineral. The lattice parameter a of both modifications was the same but the parameter c of the synthetic modification was greater than that of the natural mineral by a factor of $3/2$ ($a = 3.16 \text{ \AA}$, $c = 18.45 \text{ \AA}$). The authors proposed that the packing of the atomic layers was as follows: $aC \text{ } aC \text{ } b \text{ } Cb \text{ } A \text{ } Ba \text{ } C$ etc. One layer of sulphur atoms was rotated 60° relative to the other which led to the position of the molybdenum atom being changed from the centre of a prism to the centre of an octahedron. An alternative method of packing is, however, possible, namely $aB \text{ } aC \text{ } A \text{ } Cb \text{ } C \text{ } Ba \text{ } B$ etc, giving the Mo atom in the centre of a trigonal prism. The theoretical intensities of several lines

Card 1/3

25890
S/070/61/006/004/002/007
E021/E406

The crystal structure ...

calculated on the basis of these two theories, and the experimental intensities of reflections with $h \neq Bn$ for the rhombohedral modification are given in the table. From the results it is proposed that the Mo atom is in the centre of a trigonal prism and not in an octahedron as proposed by Bell and Herfert. It is proposed that the packing and structure of GaSe and InSe are analogous to the case of MoS₂. The structure for InSe is shown in Fig.2 where instead of one Mo atom there are two In atoms in the trigonal prism. The book of N.V.Belov ("On the structure of ion crystals", 1947) is mentioned. There are 2 figures, 1 table and 10 references: 5 Soviet and 5 non-Soviet. The two references to English language publications read as follows: G.Kimball, J.Chem.Phys., 8, 2, 188-198, 1940 and R.E.Bell, R.E.Herfert. J.Amer.Chem.Soc., 79,13,3351-3355,1957.

ASSOCIATION: Institut kristallografii AN SSSR
(Institute of Crystallography AS USSR)

SUBMITTED: October 31, 1960

Card 2/3

S/161/62/004/005/024/055
B125/B108

AUTHOR: Semiletov, S. A.

TITLE: The high-voltage photoelectromotive force in thin films of cadmium telluride

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1241-1246

TEXT: By means of electron diffraction the author investigated films of CdTe, sprayed in a vacuum of $\sim 10^{-4}$ mm Hg on glass and NaCl backings. The crystals of thin films have no noticeable orientation. Thick CdTe films ($\sim 2\mu$) give no arc-shaped reflexes but a distinct dot pattern which is indicative of the hexagonal or cubic phases. The structure of a CdTe film of $\sim 1\mu$ thickness has the following three principal properties: (1) The clear orientation of the crystallites is caused by the one-sided supply of matter from the molecular beam to the growing crystal. (2) Crystallites of varying structure (cubic and hexagonal of the 12H type) grow in the CdTe film. (3) A hexagonal phase with many packing defects arises in the crystallites. The high-voltage electromotive force in CdTe films is caused by packing defects and by the boundaries.

Card 1/2

✓

The high-voltage photoelectromotive ...

S/181/62/004/005/024/055
B125/B108

of transitions from hexagonal to cubic packing and vice versa. This photoelectromotive force is proportional to the sine of the angle between the normal to the film and the direction of the molecular beam carrying substance upon the backing. There are 4 figures. The most important English-language reference is: M. Pensak. Phys. Rev., 109, 2, 600, 1958. ✓

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography AS USSR) Moscow

SUBMITTED: December 30, 1961

Card 2/2

24.7700 1143, 1160, 1158

21567
S/020/61/137/003/016/030
B104/B214

AUTHOR: Semiletov, S. A.

TITLE: The crystal structure of indium selenide In_2Se_3

PERIODICAL: Doklady Akademii nauk SSSR, v. 137, no. 3, 1961, 584-587

TEXT: Indium selenide belongs to the interesting group of $A_2^{III}B_3^{IV}$ semiconductors (Al, Ga, In with S, Se, and Te) most of which have the structure of ZnS. The defect structure of this structure type and its effect on the electric properties of these compounds is discussed in the introduction of the paper. The present paper is concerned with the determination of the structure of In_2Se_3 which has not yet been exactly worked out. The specimens used were sublimates which were sublimated on mica sheets at room temperature and then annealed. The electron diffraction picture of a specimen annealed for 2 hr at 180°C showed a clear reflection of a hexagonal lattice cell with $a' = 4.00 \text{ \AA}$ and $c' = 19.24 \text{ \AA}$. From essentially weaker reflections he determined a hexagonal lattice cell with $a = 16.00 \text{ \AA}$ and $c = 19.24 \text{ \AA}$ was also seen. From other specimens

Card 1/4

21567

The crystal structure of indium ...

S/020/61/137/003/016/030
B104/B214

which had been sublimated in the range of from 350 - 450°C (above the first conversion temperature) followed by annealing at 350°C for 7-8 hr a hexagonal lattice cell with $a = 7.11 \pm 0.01$ Å and $c = 19.30 \pm 0.04$ Å was established. Diffraction patterns of polycrystalline In_2Se_3 which had been annealed at 500-600°C for 10-12 hr showed another cubic structure with lattice constant $a = 10.1$ Å. Also a probable monoclinic δ modification could be established. With the help of geometric structural analysis the author was able to prove that in the basic structure of the β modification there exists a two-layer hexagonal packing of the Se atoms, and that the In atoms lie in the tetrahedral vacancies of these packings, the latter regularly occupying those vacancies which are connected by a screw axis. (Fedorov space group $C_3^2 = C6_5$). The parameter z was found to be given by $z_{\text{In}} = 0.130$. From this it is concluded that there exists a covalent interaction between the atoms in the β modification. The data show that in the α modification there are 160 atoms per unit lattice. Therefore, the determination of the structure is extraordinarily difficult. However, the problem is very much simplified by the existence of a pseudo-period and the simple coupling between the lattice periods of the

Card 2/4

The crystal structure of indium ...

21567

S/020/61/137/003/016/030
B104/B214

α and β modifications. The following model for the structure is suggested: As in the β modification the basic structure is assumed to be a two-layer hexagonal packing of Se atoms (space group $C_6^6 - C6_3$). 1/16 of the In atoms lie in octahedral vacancies and the rest in tetrahedral ones. There is an arrangement of well developed five-layer packings SeInSeInSe while on the c-axis two similar packings are arranged. There exist Van der Waals forces between the packings. With this model the weak reflections in the electron diffraction picture can be explained as error in the arrangement of the five-layer packings. The strong decrease in electrical conductivity on the phase transition $\alpha \rightarrow \beta$ is explained by the rearrangement of 1/16 of the In atoms from arrangement in octahedral vacancies to that in tetrahedral. There are 3 figures and 8 references: 7 Soviet-bloc and 5 non-Soviet-bloc.

ASSOCIATION: Institut kristallografii Akademii nauk SSSR
(Institute of Crystallography, Academy of Sciences USSR)

PRESENTED: September 14, 1960, by N. V. Belov, Academician
Card 3/4

21567

The crystal structure of indium . . .

S/020/61/137/003/016/030
B104/B214

SUBMITTED: June 9, 1960

Card 4/4

S/070/62/007/006/003/020
E132/E435

AUTHORS: Man, L.I., Semiletov, S A.

TITLE: The structure of thin films of the compound TlBiSe_2

PERIODICAL: Kristallografiya, v.7, no.6, 1962, 844-849

TEXT: Crystalline films of TlBiSe_2 on NaCl or on celluloid were obtained by fast evaporation of the alloy on to a cold substrate or by annealing an amorphous layer obtained by slow evaporation. Electronograms could be indexed with a f.c.c. cell having $a = 6.18 \text{ \AA}$, which would correspond to $Z = 2$. This cubic modification had the NaCl structure with a statistical distribution of Tl and Bi atoms. By evaporation on to hot NaCl (200°C) other diagrams were obtained which could be indexed on a hexagonal cell with $a = 4.24$ and $c = 22.33 \text{ \AA}$ by analogy with TlSbTe_2 and TlBiTe_2 . A model structure was chosen, with the space group $R\bar{3}m$, having 6Se in 6(c) positions with $z = 0.25$, 3Tl in 3(a) and 3Bi in 3(b). Observed and calculated structure factors were compared, giving signs which were used for calculating the three-dimensional line summations $(0,0,z)$ and $(1/3,2/3,z)$. Large specimens of the disordered cubic phase for Card 1/2

S/070/62/007/006/003/020

E132/E435

The structure of thin films ...

X-ray analysis could not be prepared and it may be metastable. A geometrical relationship was found between the cubic and hexagonal phases where the hexagonal a and b axes are parallel to cubic $[1\bar{1}0]$ and $[0\bar{1}1]$ and the c axis to $[111]$. The hexagonal form grows with its $\{10\bar{1}4\}$ faces parallel to the 100 NaCl substrate. There are 8 figures.

ASSOCIATION: Institut kristallografii AN SSSR
(Institute of Crystallography AS USSR)

SUBMITTED: March 14, 1962

Card 2/2

KURDYUMOVA, R. N.; SEMILETOV, S. A.

Some structural characteristics of the cubic modification
of copper iodide (γ -CuI). Kristallografiia 7 no.3:366-370
My-Je '62. (MIRA 16:1)

1. Institut kristallografi AN SSSR.

(Copper iodide crystals)

On a method of production of monocrystalline films of semiconductors.
S. A. Semiletov.

Preparation, structure, and some properties of monocrystalline layers
of lead selenide. S. A. Semiletov, I. P. Voronina.

On a method of preparation of thin films of indium antimonide of
stoichiometric composition. P. S. Agalarzade, S. A. Semiletov,
E. G. Pinsker.

New phases in the system gallium-tellurium. V. V. Vlasov, S. A. Semiletov.

Some questions on the crystal chemistry of semiconductors with the
structure of bismuth telluride. S. A. Semiletov.
(Presented by S. A. Semiletov--20 minutes).

Report presented at the 3rd National Conference on Semiconductor Compounds,
Kishinev, 16-21 Sept 1963

S/070/63/008/002/016/017
E021/E120

AUTHORS: Agalarzade P.S., and Semiletov S.A.

TITLE: A method of preparing thin films of indium antimonide by vaporization in vacuo

PERIODICAL: Kristallografiya, v.8, no.2, 1963, 298-300

TEXT: A method similar to that of L. Harris and M. Siegel (J.Appl.Phys., v.18, no.8, 1948, 739-741) was used to prepare indium antimonide films. Small particles of the required alloy were fed continuously into a heated crucible. The apparatus consisted of a hollow cylinder and a screw. The rate of feeding of the powder was regulated by the pitch and rate of rotation of the screw. Complete vaporization of the particles of the alloy fed into the crucible was the main condition for successful operation. Indium antimonide films both with electron and with hole conductivity were prepared by vaporization. The electron mobility depended strongly on the size of the crystals in the film. There was a similar dependence, but less sharply defined, in the case of samples with hole-type conductivity. The mobility of electrons was up to $20\,000\text{ cm}^2/\text{v}\cdot\text{sec}$ and the mobility of holes

Card 1/2

A method of preparing thin films ...

S/070/63/008/002/016/017
E021/E120

was of the order of $600 \text{ cm}^2/\text{v. sec.}$ When alloys with impurity concentrations of the order of 10^{17} cm^{-3} were evaporated, the concentration of impurities in the films produced was $3 - 4 \times 10^{16} \text{ cm}^{-3}$. Electron diffraction studies of the films showed that there were two modifications of crystallites - cubic and hexagonal.

There are 2 tables.

ASSOCIATION: Institut kristallografii AN SSSR
(Institute of Crystallography, AS USSR)

SUBMITTED: December 15, 1962

Card 2/2

AGALARZADE, P.S.; SEMILETOV, S.A.

Methodology of producing thin films of indium antimonide by
vaporization in a vacuum. Kristallografiia 8 no.2:298-300
Mr-Ap '63. (MIRA 17:8)

1. Institut kristallografii AN SSSR.

SEMILOTOV, S.A.; VLASOV, V.A.

Electron diffraction study of phases in the system gallium - tellurium. Kristallografiia 8 no.6:877-883 N-D'63.

(MIRA 17:2)

1. Institut kristallografii AN SSSR i Institut fiziki i matematiki AN Moldavskoy SSR.

SEMILETOV, S.A.

Solubility of the components in $A^{III}B^V$ compounds.
Kristallografiia 8 no.6:923-925 N-D'63. (MIRA 17:2)

1. Institut kristallografii AN SSSR.

SEMILETOV, S.A.; VORONINA, I.P.

Production, structure and some properties of single-crystal
lead selenide films. Dokl. AN SSSR 152 no.6:1350-1353 0 '63.
(MIRA 16:11)

1. Institut kristallografii AN SSSR. Predstavleno akademikom
A.V. Shubnikovym.

ACCESSION NR: AP4034941

S/0181/64/006/005/1540/1542

AUTHORS: Voronina, I. P.; Semiletov, S. A.

TITLE: The electrical properties of monocrystalline (epitaxial) films of PbSe

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1540-1542

TOPIC TAGS: electric property, epitaxial film, lead selenide, Hall constant, electric conductivity, carrier mobility

ABSTRACT: The samples for this study were prepared by volatilizing melts of PbSe and PbSe + 0.5% Se from graphite and tantalum evaporators in a vacuum of

10^{-4} - 10^{-5} mm Hg. The base for each sample was a fresh cleavage face of rock salt heated to 200-400C. The single-crystal character of the film was attested by electron-diffraction studies. Results show that higher temperatures of the base during sputtering lead to greater carrier mobility, a fact clearly related to the structure of the film. The type of conductivity in the film changed when base temperatures reached 480-500C. This was possibly due to solution of oxygen atoms in the film. The maximum mobility was observed for base temperatures of

450-500C and amounted to about 800-1000 $\text{cm}^2/\text{v sec}$, much higher values than

Card 1/2

ACCESSION NR: AP4034941

ever obtained for polycrystalline films of PbSe. The electrical conductivity decreased with increase in temperature. Measurements of the Hall constant show that the impurity concentration between 80 and 450K changes very little. This means that the conductivity in this range is impurity conductivity. Decline in conductivity with rising temperature is due to decrease in mobility. The temperature dependence of carrier mobility in thin films is thus seen to differ from that in large single crystals, and the reason may be the presence of numerous defects and elastic strains in the thin films. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Institut kristallografii AN SSSR, Moscow (Institute of Crystallography AN SSSR)

SUBMITTED: 26Jul63

DATE ACQ: 20May64

ENCL: 00

SUB CODE: SS, EM

NO REF SOV: 000

OTHER: 003

Card 2/2

ACCESSION NR: AP4039688

S/0181/64/006/006/1898/1900

AUTHORS: Voronina, I. P.; Semiletov, S. A.

TITLE: Structure and electrical properties of monocrystalline films of lead telluride

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1898-1900

TOPIC TAGS: lead telluride, thin film, electric property, electric conductivity, carrier mobility, temperature dependence, carrier density, Hall constant, thermal emf

ABSTRACT: Experimental results are presented of the electrical properties of thin ($\sim 1 \mu$) monocrystalline films of lead telluride. The temperature dependence of the electroconductivity and electron mobility is shown graphically. Both decrease with increasing temperature. Measured values of the Hall constant ranged from 2-20 $\text{cm}^5/\text{coulomb}$. The thermal emf varied from -100 to -300 $\mu\text{V}/\text{deg}$ (relative to copper) depending on the carrier concentration. The measurements of the thermal emf were performed at the IP AN SSSR (Institute of Physics AN SSSR) under the guidance of A. Ye. Sergeyeva. Orig. art. has: 1 equation, 2 diagrams, and 1 table.

Card 1/2

ACCESSION NR: AP4012278

S/0070/64/009/001/0084/0091

AUTHOR: Semiletov, S. A.

TITLE: A method of growing monocrystalline (epitaxial) films of semiconductors

SOURCE: Kristallografiya, v. 9, no. 1, 1964, 84-91

TOPIC TAGS: monocrystalline film, epitaxial film, semiconductor, ideal structure, vapor pressure, defect, impurity, PbS, PbSe, PbTe, Ge

ABSTRACT: The author has examined several peculiarities in growing thin films by condensation of vapor in a vacuum, in particular the possibility of growing monocrystalline films by an epitaxial process. Poor physical properties in monocrystalline films of Ge have been proved to result from the large number of defects. These defects develop because of disequilibrium during growth. But in growing material from vapor in a vacuum (by epitaxy) it is possible to obtain monocrystalline films with more or less ideal structure when the substance or compound has high vapor pressure in the solid state, high mobility of atoms or molecules on the surface of the base (substrate), and rather high critical temperature of condensation. In optical properties, these monocrystalline films of PbS,

Card 1/2

ACCESSION NR: APh012278

PbSe, and PbTe do not differ from single crystals grown from melts. However, study of films by optical means does not give sufficiently reliable information on the presence of defects and impurities. Electrical conductivity and the Hall effect were therefore measured. The results are comparable with those obtained for single crystals grown by other methods. The author concludes, therefore, that films with nearly ideal structure may be grown in the indicated manner. "I. P. Voronina participated in this study." Orig. art. has: 4 figures and 2 tables.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography AN SSSR)

SUBMITTED: 07Mar63

DATE ACQ: 19Feb64

ENCL: 00

SUB CODE: PH

NO REF SOV: 013

OTHER: 008

Card 2/2

WRITE BELOW THIS LINE

POSTCARD

ACCESSION NR: AP4043187

S/0070/64/009/004/0486/0489

AUTHOR: Semiletov, S. A.; Voronina, T. P.

TITLE: Structure and electrical properties of lead telluride single crystal thin films

SOURCE: Kristallografiya, v. 9, no. 4, 1964, 486-489, and insert facing p. 465

TOPIC TAGS: lead telluride, epitaxial growth, single crystal film, polycrystalline film, thin film, single crystal film structure, film electrical property, semiconductor property

ABSTRACT: The structure and electrical properties of single crystal epitaxial films of lead telluride PbTe were determined and compared with the already known properties of polycrystalline PbTe films. Thin (less than 0.5 μ) and thick (up to 10 μ) layers of epitaxial PbTe were grown by vacuum deposition on crystalline NaCl, KCl, mica, or glass substrates heated to 200—400C. Electronographic and micrographic studies produced evidence of a single crystal, although

Card 1/3

WRITE BELOW THIS LINE

POSTCARD

ACCESSION NR: AP4043187

The carrier concentration was approximately $7 \times 10^{17} \text{ cm}^{-3}$ versus 10^{19} cm^{-3} for polycrystalline films. Orig. art. has: 4 figures and 2 tables.

ASSOCIATION: Institut kristallografi AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 25Feb64

ATD PRESS: 3087

ENCL: 00

SUB CODE: SS

NO REF SOV: 003

OTHER: 005

Card 3/3

L 24124-65 EEC(b)-2/EWT(1)/EWT(m)/EWP(b)/T/EWP(t) IJP(c) GG/JD
 ACCESSION NR: AP4043188 S/0070/64/009/004/0490/0497

AUTHOR: Semiletov, S. A.; Agalarzade, P. S.

TITLE: The structure and electrical properties of thin InSb films 21

SOURCE: Kristallografiya, v. 9, no. 4, 1964, 490-497

TOPIC TAGS: indium antimonide, thin film, semiconductor, carrier concentration, carrier mobility, Hall effect, electric conductivity

ABSTRACT: By use of continuous feeding and of a heated evaporator, InSb films were obtained having both hole and electron conductivity, a carrier concentration 10^{16} cm^{-3} , and an electron mobility which reached $20,000 \text{ cm}^2/\text{v-sec}$ in the best samples at room temperature. The hole mobility reached $660 \text{ cm}^2/\text{v-sec}$. The initial InSb was in the form of a powdered single crystal with hole or electron conductivity. The measurements covered the temperature dependence of the electric conductivity, the Hall coefficient, and magnetoresistance of InSb films, and were carried out at about 10^{-3} mm Hg with the usual dc potentiometer circuit. Electron diffraction patterns were used to test the stoichiometry of the InSb and the absence of antimony. Indexing indicated the presence of both cubic and hexagonal small crystal of InSb. Patterns obtained from thicker (1-2) films indicated a

Cord 1/38

L 24124-65

ACCESSION NR: AP4043188

4
considerable number of packing defects in the crystal. The crystal size was found to be strongly dependent on the film thickness. Depending on the initial material used, the films were found to be of n or p type (the latter only if the temperature did not exceed 300--350°C). The electron conductivity of all samples deposited at a substrate temperature exceeding 350°C is explained by the relatively higher mobility of the electrons and the crystal size. Plots are presented of the temperature dependence of the conductivity, the Hall coefficient, and the carrier mobility in n and p type films. The activation energy of impurity centers in p-type films was found to be 0.023 eV. The slope of the temperature vs. carrier mobility curves was found to depend at low temperatures on the crystal size. "The authors express their deep gratitude to Professor Z.G. Pinsker, V.D. Vasil'yev, and L. N. Yurkova for their interest in the work, advice, and assistance in measuring the electrical properties of the films." Orig. art. has: 8 figures, 1 formula, and 1 table.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 23Mar64

ENCL: 01

SUB CODE: SS

NO REF SOV: 004

OTHER: 006

Card 2/3

ACCESSION NR: AP4043197

S/0070/64/009/004/0574/0574

AUTHORS: Aytkhozhin, S. A.; Semiletov, S. A.

TITLE: Preparation of GaSb thin films by vacuum evaporation

SOURCE: Kristallografiya, v. 9, no. 4, 1964, 574

TOPIC TAGS: gallium compound, thin film, vacuum evaporation, electron diffraction, crystallite, carrier mobility, carrier density

ABSTRACT: The electrical properties of GaSb thin films have not been sufficiently investigated because the composition of the films differs considerably from that of the original material. The method of preparing GaSb films described in this paper consists in continuously supplying a small amount of material to a preheated evaporator by means of a screw turning inside a hollow cylinder. The temperature of the evaporator was chosen such as to allow a sufficiently fast rate of evaporation of gallium. The structure of the thin films

Cord 1/3

ACCESSION NR: AP4043197

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography, AN SSSR)

SUBMITTED: 15Jan64

ENCL: 00

SUB CODE: SS

NR REF SOV: 002

OTHER: 001

Card 3/3

L 26621-65 EWT(1)/EWT(m)/T/ENP(t)/EEC(b)-2/ENP(b) IJP(c) CC/JD

ACCESSION NR: AP5002161

S/0120/64/000/006/0131/0132

AUTHOR: Agalarzade, P. S.; Semiletov, S. A.

24
18
8

TITLE: Hall generator based on indium antimonide thin films

SOURCE: Pribyry i tekhnika eksperimenta, no. 6, 1964, 131-132

TOPIC TAGS: Hall generator

ABSTRACT: Some data on an InSb Hall generator ($0.6 \times 0.3 \times [1.5-2] \times 10^{-4}$ cm) are reported. Resistance of the generator is 100 ohm; Hall-emf vs control-current curve is linear up to 18 mamp (or 300 amp/cm²) in a 7-koe field; maximum dissipation power is 0.2 w; maximum sensitivity, 200 μ v/oe; temperature coefficient, 2%/C; electron mobility, 20,000 cm²/v·sec. Comparative data for single crystals and doped films are given in tables. Orig. art. has: 3 figures, 1 formula, and 1 table. [03]

ASSOCIATION: Institut kristallografi AN SSSR (Institute of Crystallography, AN SSSR)

Card 1/2

L 26621-65

ACCESSION NR: AP5002161

SUBMITTED: 14Mar64

ENCL: 00

SUB CODE: EM, 55

NO REF SOV: 004

OTHER: 000

ATD PRESS: 3188

Card 2/2

L 28739-65 EWT(m)/T/EWP(t)/EWP(b) JD

ACCESSION NR: AP5004346

S/0070/65/010/001/0109/0112

AUTHOR: Agayev, K. A.; Semiletov, S. A.

TITLE: Electron diffraction investigation of the structure of GeBi_2Te_4

SOURCE: Kristallografiya, v. 10, no. 1, 1965, 109-112

TOPIC TAGS: electron diffraction, crystal structure, germanium compound, bismuth compound, tellurium compound

ABSTRACT: This is the first electron-diffraction investigation of the compound that results when GeTe and Bi_2Te_3 are combined in a 1:1 ratio. The test samples were made by sublimation of the alloy in vacuum on substrates constituting the cleavage faces of NaCl crystals heated to 150°C . The sublimated films were annealed in vacuum and electron-diffraction patterns of the oblique texture type were produced. An interpretation of the diffraction patterns shows that the structure is layered, hexagonal, with periods $a = 4.28 \pm 0.02$ and $c = 39.2 \pm 0.2 \text{ \AA}$ (NaCl standard), space group $R\bar{3}m$. The coordinates of the atoms were: $3\text{Ge} \rightarrow 3(a) \rightarrow 000$; $6\text{Bi} \rightarrow 6(c) \rightarrow 00z$ ($z_1 = 0.425$); $6\text{Te}_1 \rightarrow 6(c) \rightarrow 00z_1$ ($z_1 = 0.136$); and $6\text{Te}_2 \rightarrow 6(c) \rightarrow 00z_2$ ($z_2 = 0.289$). The basis of the structure is a 12-layer

Card 1/2

L 28739-65

ACCESSION NR: AP5004346

rhombohedral packing of the Te atoms, in which the atoms Ge and Bi occupy in ordered fashion $3/4$ of the octahedral voids. The shortest interatomic distances are Ge-Te = 3.00, Bi-Te₁ = 3.02, Bi-Te₂ = 3.10, and Te-Te = 3.40 Å. The non-confidence factor of the structure is R = 23%. "The authors thank R. M. Imamov and A. G. Talybov for help with the work. The alloy was synthesized by Ye. I. Yelagina in the laboratory of Professor N. Kh. Abrikosov (Institut metallurgii /Institute of Metallurgy/)." Orig. art. has: 3 figures and 5 formulas.

ASSOCIATION: Institut khimii AN AzerbSSR (Institute of Chemistry AN AzerbSSR); Institut kristallografi AN SSSR (Institute of Crystallography AN SSSR)

SUBMITTED: 18Jul64

ENCL: -00

SUB CODE: SS, NP

NR REF SOV: 002

OTHER: 001

Card 2/2

L 24207-65 EWT(1)/EWT(m)/T/EWP(t)/EEC(b)-2/EWP(b) LJP(s) JD/GG
 ACCESSION NR: AP5002905 S/0109/65/010/001/0112/0115

AUTHOR: Agalarzade, P. S.; Semiletov, S. A.

TITLE: Preparation and some properties of indium-antimonide alloy films

SOURCE: Radiotekhnika i elektronika, v. 10, no. 1, 1965, 112-115

TOPIC TAGS: indium antimonide film, semiconductor device

ABSTRACT: An investigation is reported of the electrical properties of InSb-In₂Te₃ films prepared by feeding a proportioned mixture of InSb and In₂Te₃ (0.03—5%) into a hot vaporizer. The electrical conductivity and Hall effect were measured at temperatures between -180 and +200 C by means of the conventional d-c potentiometer method. Degenerate films with an electron concentration of up to 10^{17} — 10^{19} per cm³ were obtained. Electron mobility in alloyed and nonalloyed films largely depended on temperature, reaching 13,000 cm²/vsec. (In single crystals of InSb, it reaches 16,000.) A theoretical explanation of the mechanism of the formation of additional carriers in InSb films is offered. Orig. art. has: 4 figures and 2 tables. [03]

Card 1/2

L 24207-65

ACCESSION NR: AP5002905

ASSOCIATION: Institut kristallografi AN SSSR (Institute of Crystallography,
AN SSSR)

SUBMITTED: 06Jan64

ENCL: 00

SUB CODE: S5

NO REF SOV: 001

OTHER: 002

ATD PRESS: 3177

Card 2/2

L 57588-65 EWT(1)/EWT(m)/EWP(1)/EWG(m)/EPA(w)-2/EEC(t)/I/EWP(t)/EWP(b)/EWA(m)-2/EWA(c)

Pz-6/Pi-4 IJP(c) RD:JD/AT

ACCESSION NR: AP5013720

UR/0070/65/010/003/0407/0409

548.736

44
43
B

AUTHOR: Man, L. I.; Semiletov, S. A.

TITLE: Preliminary electron diffraction studies of the structure of In₂Se semiconductor compound

SOURCE: Kristallografiya, v. 10, no. 3, 1965, 407-409

TOPIC TAGS: electron diffraction, semiconductor material

ABSTRACT: Test samples were prepared by vacuum deposition of In₂Se alloy on sodium chloride crystals followed by heat treatment. Electron diffraction analysis of the In₂Se films showed that they were grain-oriented. Pictures of oblique textures with [100] and [010] axes of the lattice were obtained. The lattice parameters were: $a = 15.24$, $b = 12.32$, $c = 4.075$ Å. The intensities of the reflections were evaluated visually. The inadequate quality of pictures and the reduction to a single scale for the intensity of reflections introduced additional errors. A subsequent transformation from intensities to F^2 values was made using the formula

$$F^2 = I/pd_{hkl}d_{hko}.$$

Card 1/2

L 57588-65

ACCESSION NR: AP5013720

Analysis of the photographs showed that the structure was pseudo-periodic along the x-axis. The reflections of the zero, third and sixth layer lines of patterns with orientation [100] had a substantially greater intensity than the reflections of the first, second, fourth and fifth layer lines. The projections and cross-sections of the F^2 series were constructed on a series of planes. Taking into account the dimensions of the In and Se atoms it was concluded that the atoms of both elements could exist only in a common position

$$4(g) : xy0; \bar{x}y0; \frac{1}{2}+x, \frac{1}{2}-y, \frac{1}{2}; \frac{1}{2}-x, \frac{1}{2}+y, \frac{1}{2}.$$

This means that the atoms are paired only in two planes ($xy0$) and $xy\frac{1}{2}$). A comparison of the experimental values of atomic parameters with theoretical ones showed good agreement.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography AN SSSR)

SUBMITTED: 24Oct64

ENCL: 60

SUB CODE: SS *NP*

NO REF SOV: 005

OTHER: 004

Card *1/1*

L 59508-65 EWT(1)/EWT(m)/EWP(1)/T/EWP(t)/EWP(b)/EWA(h)/EWA(c) Pz-6/Peb IJP(c)
JD/JG/AT

ACCESSION NR: AP5018716

UR/0070/65/010/004/0492/0496

AUTHOR: Aytkhozhin, S. A.; Semiletov, S. A.

TITLE: Structure and electrical properties of thin films of p-type gallium antimonide

SOURCE: Kristallografiya, v. 10, no. 4, 1965, 492-496, and top half of insert facing p. 475

TOPIC TAGS: A³B⁵ semiconductor, gallium antimonide, polycrystalline thin film, thin film preparation, thin film structure, electrical property

ABSTRACT: The preparation, structure, and electrical properties of GaSb polycrystalline thin films have been studied because of the known impossibility for obtaining GaSb crystals with electrical characteristics (donor concentration) comparable to those of other A³B⁵ semiconductor compounds. Polycrystalline GaSb thin films (up to 100 μ thick) were prepared from p-type single crystals by vacuum vaporization on an amorphous (glass or quartz) or crystalline (phlogopite) substrate heated at a temperature in the 420-620C range. Electron diffraction patterns of the films indicated the presence of cubic and hexagonal phases in the films grown under optimum conditions. Microphotographs of the films showed an increasing accumulation of

Card 1/2

L 59508-65

ACCESSION NR: AP5018716

Ga excess (over stoichiometry) on the crystallites with increasing substrate temperature and vaporization time, owing to a partial decomposition of GaSb in the process of film deposition on a heated substrate. Dimensions of crystallites also increased with increasing substrate temperature. The temperature dependence (in the -190 to 700C range) of electric conductivity, Hall constant, and hole mobility of the 10 μ thick films followed nearly identical patterns, regardless of the substrate temperature. The Hall constant pattern was typical of the hole-type semiconductors. The absolute values of electric parameters varied with the substrate temperature. The calculated forbidden energy gap and activation energy of impurity centers were found to be 0.68 eV and 0.017 eV, respectively, i.e., nearly close to the values obtained earlier in single crystals. The conclusion was made that polycrystalline films deposited under optimum conditions approach single crystals in respect to basic electrical parameters. A considerable increase in hole mobility with decreasing temperature in GaSb thin films was compared with the earlier established opposite temperature dependence pattern of hole mobility in InSb films. Orig. art. has: 6 figures, 1 table, and 2 formulas. [JK]

ASSOCIATION: Institut kristallografi AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 03Dec64

ENCL: 00

SUB CODE: SS

NO REF SOV: 002

OTHER: 011

ATD PRESS: 4052

Card 2/2